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ABSTRACT

For information on the Visual Arts Education Curriculum of which this is one course, see SO 007 721. In this course students study ceramic material, form, and decoration, historically and technically, and demonstrate competencies in preparing clay bodies and ceramic glazes. Course content is outlined in those areas. Special sections of the guide include lists of the following criteria for evaluating the student's art experience; recipes for glazes, resources such as books and periodicals on history and technique; films and slides and their sources; Professional journals for teachers; professional schools, universities, and workshops specializing in pottery; local resources in Florida; and suppliers. (JH)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

SP 007 727

ART EDUCATION

CERAMIC TECHNOLOGY

6688.02

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

ED 095083

CERAMIC TECHNOLOGY

6608.02

ART EDUCATION

Written by: Louis M. Marinaccio

for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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PREFACE

Learning has been referred to by many contemporary educators as a noun; but it is a verb experience--full of action and involvement, doing and being. At least it should be--and that kind of involved learning is what this course of study is all about.

The Quinmester Visual Arts Education Curriculum construct is a long range developmental effort directed towards providing a general education for learners in the aesthetically related art education field. To accomplish this goal, instructional courses of study have been developed basically for teachers by teachers. Many Dade art specialists in various arts media have been recruited by the Art Office to write over 75 new and innovative courses of study in the area of art education. Educational specialists from the four corners of this land, along with aestheticians, social critics, and behavioral scientists have hailed the philosophy of the overall art curriculum construct undertaken by the Division of Instruction to be consistent with the latest national trends in art education, and to be an exemplary example of "success" oriented curricula designed to provide intense involvement in aesthetics and creative arts through group and individualized participation on the part of the learner.

All courses of study produced have been constructed with one major goal in mind: to provide a broad framework of goals and objectives; content; instructional procedures and strategies; and suggested learning activities. Many of the technically oriented courses of study list a variety of "Work Sheets" designed to assist the learner with specific and highly technical studio procedures delineated in a manner so that art specialists (teachers) can use them "as is," or utilize the source information as a basis for producing "Learning Activities Packages." The appendix may include other pertinent material needed for today's contemporary art curriculum, e.g., vocabulary, resources for both learner and teacher, etc.

Constructive criticisms or recommendations relating to this publication are invited; please send to: Art Education Office, Room 300, Lindsey Hopkins, A-1.

Charles H. King, Consultant
Art Education

TABLE OF CONTENTS

I. COURSE TITLE 1

II. COURSE NUMBER 1

III. COURSE DESCRIPTION 1

IV. RATIONALE 1

V. COURSE ENROLLMENT GUIDELINES 2

VI. COURSE OF STUDY OBJECTIVES 2

VII. COURSE CONTENT

Definition and background 3

Preparing and developing clays and clay bodies 4

Preparing and developing various ceramic glazes .....

VIII. COURSE PROCEDURES AND STRATEGIES, AND SUGGESTED LEARNING ACTIVITIES

Evaluation 15

Criteria established for evaluation 16

IX. RESOURCES

Suggested texts for pupils 20

Suggested references

General 20

Egyptian 20

Ancient Near East 21

Classical 22

Byzantium 22

Islam 22

Pre-Columbian 22

Renaissance in Europe 23

Suggested periodicals for pupils 23

Suggested places to visit 23

X. BIBLIOGRAPHY 25

XI. APPENDIX

Suggested media resources for pupils and teachers

Film Strips 27

Slides 28

Portfolios 30

Resources for teachers

Films 30

Resource people 31

Periodicals and professional journals for teachers 32

Suppliers 34

Professional schools, universities, and workshops specializing in pottery 35

References for teachers 39

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I. COURSE TITLE

CERAMIC TECHNOLOGY

II. COURSE NUMBER

6688.02

III. COURSE DESCRIPTION

A study of the preparation and development of clay bodies and ceramic glazes. Developing knowledge of properties of various ceramic materials; earth materials and metallic oxides - calculating batches and glaze formulas.

IV. RATIONALE

The art educator should foster the growth of what is unique in the individual and help him to develop a trong sense of empathy toward his visual environment; empathy toward the sensuous quality of the material; and empathy toward the content. There should be a kinesthetic interaction between the student and the media.

Emphasis will be placed upon preparing and developing aesthetic, functional, and suitable clay bodies and ceramic glazes.

V. COURSE ENROLLMENT GUIDELINES

A. This course may be coordinated with the chemistry and math departments

B. Prerequisite: Creative Ceramic Arts

VI. COURSE OF STUDY OBJECTIVES

A. Competencies: The student upon completion of this unit will be able to:

1. Definition and background

a. Exhibit a working knowledge of material, form, decoration, and glaze treatment of clay as created by the Egyptians

b. Analyze glaze aesthetically and chemically as viewed in the ceramic wares of the Sung Dynasty, the Ming Dynasty and the Ch' ing Dynasty

2. Preparing and developing clays and clay bodies

a. Demonstrate several methods of adjusting clay bodies in order to improve their usefulness

b. List the basic characteristics of stoneware and porcelain clay bodies

c. Identify several high-fired clay bodies

d. List the basic differences between earthenware clay and stoneware clay

3. Preparing and developing various ceramic glazes

a. Identify several types of early ceramic glazes

b. Domonstrate the ability to calculate from batch to formula

c. Create several series of reduction fired test tiles

d. List ten oxides frequently used in reduction firing

VII. COURSE CONTENT

A. Definition and background

1. Historical

a. Egyptian

b. Ancient Near East

c. Asia: (India, China, Korea, and Japan)

d. Classical: (Crete, Greece, Etrusca, and Rome)

e. Byzantium (Rome)

f. Islam

g. Pre-Columbian

h. Renaissance in Europe

2. Contemporary

a. Aesthetic reaction

b. Craft Movement

c. American Indian

d. Ceramic Technologist

B. Preparing and developing clays and clay bodies

1. Methods of preparing and developing clay

a. Mixing clay

b. Wedging clay

c. Kneading clay

d. Conditioning clay

e. Aging clay

f. Storing clay

2. Classification of clays

a. Residual or primary

b. Sedimentary or secondary

3. Kinds of clay

   a. Kaolin

   b. Ball clays

   c. Fire clays

   d. Sagger clay

   e. Stoneware clay

   f. Porcelain clay

   g. Earthenware clays

   h. Other kinds of clay

      (1) Flint

      (2) Shale

      (3) Bentonite

      (4) Terra Cotta

4. Characteristics and properties of clay and clay bodies

   a. Plasticity

   b. Water of plasticity

   c. Firing range

   d. Thermal reaction

   e. Color

   f. Deformation

   g. Density

   h. Porosity

   i. Shrinkage

5. Clay Bodies

a. Methods of altering and adjusting clay bodies to improve their usefulness

b. Stoneware as an example of a high-fired clay body

c. Porcelain as an example of a clay body

d. Method of blending materials to formulate a suitable clay body

e. Formulating clay bodies designed for specific methods of construction

f. Designing clay bodies for throwing

g. Designing clay bodies for modeling

h. Designing clay bodies for casting

i. Designing clay bodies for pressing and jiggering

j. Color and texture in clay bodies

k. Earthenware as a clay body

l. Stoneware as a clay body

m. Porcelain as a clay body

C. Preparing and developing various ceramic glazes

1. Characteristics and properties of glass and glazes

a. Silica as the basis of glass

b. Creating glass

c. The difference between glass and glaze

2. Types of early glazes

a. Egyptian glazes

b. Lead glazes

c. Ash glazes

d. Salt glazes

e. Slip glazes

f. Feldspathic glazes

3. Basic oxides and their function in glaze forming

a. Oxidation and the oxides

b. Glaze oxides

c. Function of oxides in glazes

d. The process of glaze melting in kiln

4. Ceramic Oxides

a. Aluminum Oxide Al_2O_3

b. Antimony Oxide SB_2O_3

c. Barium Oxide BaO

d. Boric Oxide B_2O_3

e. Calcium Oxide CaO

f. Chromium Oxide Cr_2O_3

g. Cobalt Oxide CO_2O3

h. Copper Oxide CuO

i. Iron Oxide Fe_2O_3

j. Lead Oxide PbO

k. Lithium Oxide Li_2O

l. Magnesium Oxide MgO

m. Manganese Dioxide MnO_2

n. Nickel Oxide NiO

o. Potassium Oxide K_2O

p. Silicon Dioxide SiO_2

q. Sodium Oxide Na_2O

r. Strontium Oxide SrO

s. Tin Oxide SnO

t. Titanium Ti

u. Vanadium V

v. Zinc Oxide ZnO

w. Zirconium Oxide ZrO_2

5. Preparation of raw materials for use in glazes

a. Flint SiO_2

b. Clay $Al_2O_32SiO_22H_2O$

c. Feldspar

d. Whiting $CaCO_3$

e. Magnesium Carbonate $MgCO_3$

f. Dolomite $CaCO_3MgCO_3$

g. Barium Carbonate $BaCO_3$

h. Talc $3MgO.4SiO_2.H_2O$

i. Strotium Carbonate $SrCO_3$

j. Colemanite $2CaO.3B_2O_3.5H_2O$

k. Litharge PbO

l. White Lead $2PbCO_3Pb(OH)_2$

m. Red Lead Pb_3O_4

n. Zinc Oxide ZmO

o. Antimony Oxide Sb_2O_3

p. Soda Ash Na_2CO_3

q. Sodium Carbonate Na_2Co_3

r. Bone Ash, Calcium Phosphate $4Ca_3(PO_4)2.CaCo_3$.

s. Cryolite Na_3AlF_6

t. Lepidolite $(HO_2F)_2KLiAl_2Si_3O_{10}$

u. Lithium Carbonate Li_2CO_3

v. Fluorspar CaF_2

Pearl Ash, Potassium Carbonate K_2CO_3

w. Niter, Potassium Nitrate KNO_3

x. Borax $Na_2B.2B_2O_3.10H_2O$,

6. Theory and objectives of glaze calculations

a. Oxides are grouped according to their function in glazes

b. Theory of Atomic Weight

c. The Unity Formula

d. Calculating Recipes of Glazes from their Formula

e. Calculating from the batch to the formula

7. Calculating glaze using materials containing more than one oxide

a. Table of raw materials

b. Equivalent weight

c. Feldspar formulas

d. Calculation of the batch from the formula of a simple lead glaze

e. Calculation of glaze containing both feldspar and clay

f. Selection of raw materials for glaze

g. Calculation of several more complicated glazes

h. Calculation of glaze involving a complex feldspar

8. Calculating glaze formulas from recipes or batches

a. Determining the formula of a glaze from recipe

b. The Process of calculating from the batch to the formula

9. Problems encountered in practical glaze calculation
   a. Substitution of materials
   b. Comparison lf glazes
   c. Alteration of glaze formulas
   d. Experimentation of new materials

10. Composition of glazes
   a. Fusion points of glazes
   b. Fluxing action of various oxides
   c. The amounts of silica and alumina in glazes
   d. Limit formulas

11. Types of glazes
   a. Low-temperature alkaline glazes
   b. Lead glazes
   c. Glazes containing boron
   d. Bristol glazes
   e. Stoneware and porcelain glazes

12. Fritted glazes
   a. Methods of preparing frits
   b. Calculating a frit batch
   c. The use of a frit as glaze

13. Glaze Textures

a. Transparency

b. Opacity

c. Bright glazes

d. Mat glazes

14. Color in glazes

a. Theory of color

b. Oxides

(1) Iron oxide

(2) Copper oxide

(3) Cobalt oxide

(4) Manganese oxide

(5) Chromium oxide

(6) Nickel oxide

(7) Vanadium oxide

(8) Rutile

(9) Ilmenite

(10) Iron chromate

(11) Uranium oxide

(12) Cadmium

(13) Selanium

c. Methods of blending, mixing, and compounding colored glazes

(1) Addition of single oxides to glazes

(2) Line blends

(3) Tri-axial blending

(4) Use of glaze stains

(5) Testing and analysis of glazes

(6) Recording results in test glazes

15. Glaze mixing and application

a. Ball milling

b. Mixing and screening glazes

c. Proportion of water in glazes

d. Gums, floatatives, and flocculents for glazes

e. Glazing by dipping, pouring, and painting

f. Spraying glazes

g. Thickness of glaze

16. Engobes

a. Engobe composition

b. Coloring oxides in engobes

c. Vitreous engobes

d. Methods of engobe application

17. Underglaze colors and decoration

a. Pigments utilized in underglaze painting

b. Methods for applying underglaze

c. Underglaze prints

18. Overglaze decoration
    a. Majolica
    b. Overglaze prints
    c. Overglaze enamels

19. Special glaze effects and glazes
    a. Crackle and pooled glazes
    b. Egyptian paste
    c. Red glazes
    d. Terra sigillata
    e. Raku ware
    f. Luster
    g. Salt glazing
    h. Slip glazes
    i. Ash glazes
    j. Crystalline glazes

20. Reduction firing and reduction glazes
    a. Theory of reduction firing
    b. Results and effects of reduction on clay bodies
    c. Reaction of base glazes to reduction
    d. The color range of reduction glazes
    e. Colors from copper oxide in reduced glazes
    f. Colors obtained in reduction firing
    g. Kiln instruction in reduction firing

VIII. COURSE PROCEDURES AND STRATEGIES, AND SUGGESTED LEARNING ACTIVITIES

A. Evaluation

It is essential to establish a criteria for evaluating the progress of the student in an art experience. Evaluation in ceramic art cannot be rigid to the extent that it will inhibit creative expression. Creativity is unique and personal.

The product itself cannot be evaluated without taking into consideration the process the student experienced from inception to completion. In addition, evaluation must include evidence of the growth of the individual in relation to his attitude, interest, ability to complete a project, how well he can use his past experience toward problem solving, respect for his own ability and the rights of others.

Evaluation is of vital importance to the student's development. It helps to determine the growth of the student so that the teacher can further motivate and guide the student toward his fullest self-development, creativity, and aesthetic growth.

B. The criteria established for evaluation will vary due to individual differences among students and teachers. Each teacher must determine his own goals and formulate standards for evaluation always keeping in mind that evaluation must be positive as well as constructive. The following are some suggestions in setting up a criteria for evaluation:

1. Has the student learned to evaluate his own pottery as well as that of others with consideration to the sensuous quality of the clay, form, and content?
2. Has the student designed the entire object with an awareness of space, form, movement, order, relationship of parts to the whole, and good color organization?

3. Has the student expressed his ideas creatively in the media in an original and meaningful way?
4. Has the student developed a sensitivity to the material?
5. Does the student express his ideas and individuality in clay?
6. Has the student become aware that texture results from an interaction of the clay and the tools?
7. Is the student aware of the difference between tactile and visual textures?
8. Has the student become sensitive to the expressive qualities of the different clay materials and tools?
9. Is the student aware that improper use of material and tools results in poorly constructed forms?
10. Is the student aware that variety can add interest to forms but too much can destroy it?
11. Does the student react empathically to clay in terms of three-dimensional forms?

12. Is the student familiar with good ceramic art of the past and present?
13. Is the student able to identify from contemporary ceramists the ways in which the craftsmen manipulate their tools and materials?
14. Has the student developed good work habits?
15. Has the student's behavior outside the art class improved as a result of his art experience?
16. Has the student developed a respect for his personal ability?
17. Has the student developed a respect for the rights of others?
18. Has the student acquired increased efficiency in handling materials and tools?
19. Has the student developed the ability to carry the project through to completion?
20. Has the student learned the firing process and how to use it to its fullest advantage?

21. Has the student developed good craftsmanship and yet retained the natural qualities of the clay?
22. Has the student learned to form pottery correctly so it does not warp or crack?
23. Is the product suited for the purpose for which it was made?
24. Does it incorporate the principles of good ceramic design?
25. Is the product the one best suited for work in clay?
26. Is the product well constructed?
27. Does the product indicate individuality and expressive quality?
28. Does the glaze fit the form?
29. Has the student improved in attitude, interests, and development of technical skills?

IX. RESOURCES

A. Suggested texts for pupils

Nelson, Glenn C., Ceramics, A Potter's Handbook. New York: Holt, Rinehart, Winston, 1971

Rhodes, Daniel, Clay and Glazes for the Artist Potter. Philadelphia: Chilton, 1957.

Suggested References

B. General

Ball, F. Carlton and Lovoos, Janice, Making Pottery Without a Wheel. New York: Rheinhold, 1965.

Hofsted, Jolyon, Step-by-Step Ceramics. New York: Golden Press, 1967.

Kenny, John B., Ceramic Sculpture. New York: Greenberg, 1953

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Suspensky, Thomas G., Ceramic Art in the School Program. Massachusetts: Davis, 1968.

C. Egyptian

Raphael, Max, Prehistoric Pottery and Civilizations in Egypt. New York: Phantom, Inc., 1947

Savage, George, Pottery Through the Ages. New York: Pelican, 1954.

Walters, H. B., History of Ancient Pottery. London: Murray, 1905.

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D. Ancient Near East

Childs, V. Gordon, New Light on the Most Ancient East. London: Rontledge and Kegan Paul, Ltd., 1935.

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Pope, Arthur U., A Survey of Persian Art. London: Oxford University, 1964.

Wilkinson, Charles K., Iranian Ceramics. New York: Harry N. Abrams, Inc., 1963.

Asia: (India, China, Korea, and Japan)

Auboyer, Jeannine and Goepper, Roger, The Oriental World. New York: McGraw-Hill Book Company, 1967.

Fourcade, Francois, Art Treasures of the Peking Museum. New York: Harry N. Abrams, Inc., 1970.

Lee, Sherman E., A History of Far Eastern Art. New Jersey: Prentice-Hall, Inc., 1964.

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Sanders, Herbert H., The World of Japanese Ceramics. California: Kodansha International, Ltd., 1967.

Savage, George, Pottery Through the Ages. New York: Pelican, 1954.

E. Classical: (Crete, Greece, Etrusca, and Rome)

Arias, P. E., Greek Vase Painting. New York: Harry N. Abrams, Inc., 1961

Marinatos, S., Crete and Mycenae. New York: Harry N. Abrams, Inc., 1960

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Walters, H. B., History of Ancient Pottery. London: J. Murray, 1905.

Wilson, Robert, Art Concept in Clay. Coral Gables: University of Miami Press, 1957.

F. Byzantium: (Rome)

Anthony, Edgar W., A History of Mosaics. Boston: Sargent, 1935.

Grabar, André, Byzantium. London: Thames and Hudson, 1966.

G. Islam

Lane, Arthur, Early Islamic Pottery. London: Faber, 1939.

_____ Later Islamic Pottery. London: Faber, 1957.

Savage, George, Pottery Through the Ages. New York: Pelican, 1954.

H. Pre-Columbian

Anton, Ferdinand and Dockstader, Frederick J., Pre-Columbian Art and Later Indian Tribal Arts. New York: Harry N. Abrams, Inc., 1968

Bernal, Ignacio, 3000 Years of Art and Life in Mexico. New York: Harry N. Abrams, Inc., 1968.

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Mason, J. Alden, The Ancient Civilizations of Peru. Baltimore: Penguin, 1957.

Westheim, Paul, The Sculpture of Ancient Mexico. New York: Doubleday and Company, Inc., 1963.

I. Renaissance in Europe

Goldscheider, Ludwig, Michelangelo's Models in Wax and Clay. London: Phaidon, 1962.

Honey, William B. Wedgewood Ware. London: Faber, 1949.

Liverani, Giuseppe, Five Centuries of Italian Majolica. New York: McGraw Hill, 1960.

Charleston, Robert J., World Ceramics. New York: McGraw Hill, 1968.

J. Suggested periodicals for pupils

Ceramics Monthly
Box 4548
Columbus, Ohio 43212

Craft Horizons
29 West 53rd Street
New York, N.Y. 10019

School Arts
50 Portland Street
Worcester, Mass. 01608

Design Quarterly
1710 Lyndale Avenue
Minneapolis 3, Minnesota

K. Suggested places to visit

Grove House School of Art
3496 Main Highway
Coconut Grove, Florida 33133

Sandpiper
2924 Florida Avenue
Coconut Grove, Florida 33133

Village Corner Gallery
1136 South Dixie Highway
Coral Gables, Florida

Lowe Art Museum
1301 Miller Drive
Coral Gables, Florida

Miami Art Center
7867 North Kendall Drive
Kendall, Florida

Ceramic League of Miami
7867 North Kendall Drive
Kendall, Florida

Miami Museum of Modern Art
381 N. E. 20th Street
Miami, Florida

Grove House Gallery
3496 Main Highway
Coconut Grove, Florida

Museum of Science-Planetarium
3280 South Miami Avenue
Miami, Florida

Fairchild Tropical Garden
10901 Old Cutler Road
Coral Gables, Florida

Fantastic Gardens
9550 S. W. 67th Avenue
Miami, Florida

Miami Seaquarium
Rickenbacker Causeway
Virginia Key, Florida

Crandon Park Zoo
Key Biscayne, Florida

Scholastic Art Awards Exhibition
Burdine's Department Store
22 E. Flagler Street
Miami, Florida

Miami Studio Shop
2363 W. Flagler Street
Miami, Florida

Bass Museum of Art
2100 Collins Avenue
Miami Beach, Florida

Japanese Gardens
MacArthur Causeway
Miami, Florida

Vizcaya Art Museum
3251 South Miami Avenue
Miami, Florida

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Wildenhain, Marguerite, Pottery Form and Expression. New York: Rheinhold, 1959.

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XI. APPENDIX

SUGGESTED MEDIA RESOURCES FOR PUPILS AND TEACHERS

A. Film strips

American Crafts Council
Research and Education Dept.
29 West 53rd Street
New York, N.Y. 10019

Contemporary Ceramics
U.S.A., 1966

Forms from the Earth:
1000 Years of Pottery in
America 1962

Scholastic Film Strips
906 Sylvan Avenue
Englewood Cliffs, N.J. 07632

Art by Talented Teen-Agers - 1970: Sculpture and other Three-Dimensional Art

Art by Talented Teen-Agers - 1969: Sculpture and other Three-Dimensional Art

Art by Talented Teen-Agers-1968: Sculpture and other Three-Dimensional Art

Art by Talented Teen-Agers - 1967: Sculpture and other Three-Dimensional Art

Art by Talented Teen-Agers - 1961-1966: Sculpture and other Three-Dimensional Art

Collected Works of Teen-Age Art - Sculpture and other Three-Dimensional Art

B. Slides

American Crafts Council
Research and Education Dept.
29 West 53rd Street
New York, N.Y. 10019

F6 Three Ceramists: Gronborg/Leady/Williams, 1969 - Ceramic sculpture from one-man exhibitions at M.C.C.

C14 Young Americans, 1969 - Winning entries in all craft media from the national competition of this title sponsored by the American Crafts Council.

C9 Objects Are ...?, 1968 An exhibition which sought to question the nature of objects. Covers work by 42 craftsmen in various media.

C7 Ceramics of Maija Grotell, 1968 - Pottery by the head of the Department of Ceramics at Cranbrook Academy of Art from 1938-1966.

B14 Craftsmen U.S.A. '66 - National Merit Awards in a competition sponsored by the American Crafts Council; covers all craft media.

B1 The American Craftsmen, 1964 - 30 craftsmen and their work in clay, metal, wood, and textiles.

A14 Forms from the Earth, 1000 Years of Pottery in America, 1962 - A summary view of pottery in America up to 1961.

Slides

A13 Young Americans, 1962 - Winning entries in all craft media from the national competition of this title sponsored by the American Crafts Council.

A6a Katherine Choy, 1961- Pottery from a retrospective exhibition at M.C.C.

F11 General Ceramics, 1960 - Functional and sculptured ceramics by contemporary American craftsmen.

D5 Contemporary Ceramics U.S.A., 1966 - Works by 77 American Craftsmen.

D6 General Ceramics, 1963 - Work of the early 1960's by American craftsmen.

F4 Objects U.S.A., 1969 - A selection of work in all media from the Johnson Collection of Contemporary Crafts.

B12 Folk Art of North India, 1966 - Ceramics, embroidery, appliqué, and jewelry from North India.

C10 Salt Glaze Kiln: building/ firing , 1969 - Construction and firing at the Byron Temple Studio; Script gives additional information on materials and techniques.

B9 The Raku Process, 1969 - Paul Soldner photographed as he fires pottery by the raku process

Prothmann Associates, Inc.
2795 Milburn Avenue
Baldwin, New York 11510

Contemporary Ceramics - a survey 1946-1964 from prize-winning entries in National and International Exhibits at the Everson Museum of Art. Syracuse, New York.

International Ceramic Exhibitions, 1958.

C. Portfolios

American Art Clay Co., Inc.
4717 West 16th Street
Indianapolis, Indiana 46227

Throwing a Cylinder

Professional Publications, Inc.
Box 4548
Columbus, Ohio 43212

Ceramic Art in America

RESOURCES FOR TEACHERS

D. Films

Bailey Films, Inc.
6509 Longore Avenue
Hollywood, California 90028

Clay Craft

Creative Ceramics:

Creating with Clay

Using the Banding Wheel

Potter's Wheel as a Tool

Beginning Wheel Techniques

Basic Wheel Forms

Art Institute of Chicago
Chicago, Illinois

The Nature of Clay

Earth, Fingers, and Fire

Coil, Slabs, and Space

Combining Clay Forms

The Student as Artist with Clay

Audio-Visual Center
Indiana University
Bloomington, Indiana

Craftsmanship in Clay:

Simple Slab Methods

Throwing

Glaze Application

Kiln Stacking and Firing

Decoration

Mold Making

RESOURCE PEOPLE

Ceramic League of Miami

Virginia L. Davis

Edmund O. Weyhe

Chili Emerman

Barbara Garrett

Geri Popenoe

Marilyn Sherwood

Lynn Glatstein

Natalie B. Linder

Janel Lund

Juanita May

Genevieve McCrea

Marie Furman

Mary Grabill

Elinor Jensen

Inga Lukat

Chris Rosean

Richard Burdal

Joan Guthrie

Josephine Kamp

Carol King

Evelyn C. Smiley

Fran Williams

Irene Batt

Dorothy Bosco

Marcy Dunn

Nettie Wintie

Edythe Powell

Virginia C. Stemples

Mary J. Acosta

Edna De Line

Jacquelyn Ferguson

Henry Gordon

Lillian H. Stoff

Terry Weinberger

Joy Lindskold

Davi Justi

Janet Festinger

PERIODICALS AND PROFESSIONAL JOURNALS FOR TEACHERS

Ceramic Age
9 Chester Building
Cleveland 14, Ohio

Ceramic Industry
5 S. Wabash Avenue
Chicago 3, Illinois

Ceramic Data Book
Industrial Publications
5 S. Wabash Avenue
Chicago 3, Illinois

Ceramics Monthly
Box 4548
Columbus, Ohio

Journal of the American
Ceramic Society
Columbus, Ohio

Journal of the National Council on
Education for the Ceramic Arts
Room 132
Fine Arts Building
University of Illinois
Champaign, Illinois

Journal of the National Art Education
Association
1201 Sixteenth Street
N.W., Washington, D. C.

Craft Horizons
29 West 53rd Street
New York, N.Y.

School Arts
50 Portland Street
Worcester, Massachusetts

Design Quarterly
1710 Lyndale Avenue
Minneapolis 3, Minnesota

SUPPLIERS:

Clays, Kilns, and Equipment

Newton Pottery Supply Co.
Newton, Massachusetts

Norman Ceramics Co., Inc.
225 Mamaroneck Avenue
Mamaroneck, N. Y.

Craftools, Inc.
401 Broadway
New York, N.Y.

Stewart Clay Co., Inc.
133 Mulberry Street
New York, N.Y.

Cedar Heights Clay Co.
50 Portsmouth Road
Oak Hill, Ohio

Harrop Ceramic Service
347 East 5th Avenue
Columbus, Ohio

W. M. Fairchild
712 Centre Street
Freeland, Pennsylvania

O. Hommel Co.
209 Fourth Avenue
Pittsburgh, Pennsylvania

Kentucky-Tennessee Clay Co.
Mayfield, Ohio

U. S. Stoneware Co.
Akron, Ohio

A. D. Alpine, Inc.
11837 Teale Street
Culver City, California

Advanced Kiln Co.
2543 Whittier Boulevard
Los Angeles, California

Garden City Clay Co.
Redwood City, California

Western Ceramic Supply Co.
1601 Howard Street
San Francisco, California

Western Stoneware Co.
Monmouth, Illinois

American Art Clay Co.
4717 West 16th Street
Indianapolis, Indiana

Denver Fire Clay Co.
3033 Black Street
Denver, Colorado

Van Howe Co.
1185 South Cherokee Avenue
Denver, Colorado

Miami Studio Shop
2363 W. Flagler Street
Miami, Florida

PROFESSIONAL SCHOOLS, UNIVERSITIES, AND WORKSHOPS SPECIALIZING IN POTTERY

Troy State College
Troy, Alabama

Northern Arizona University
Flagstaff, Arizona

Arkansas Arts Center
School of Art and Drama
MacArthur Park
Little Rock, Arkansas

University of California
Department of Design
234 Wurster Hall
Berkeley, California

University of California
Davis, California

Mills College
Oakland, California

San José State College
San José, California

California College of Arts & Crafts
5212 Broadway at College Avenue
Oakland, California

Pond Farm Pottery
Guerneville, California

University of Colorado
School of Art
Denver, Colorado

The Corcoran School of Art
17th St. at New York Ave., N.W.
Washington, D. C.

Georgia State College
33 Gilmer Street, S.E.
Atlanta, Georgia

School of the Art Institute of Chicago
Michigan at Adams
Chicago, Illinois

University of Illinois
College of Fine and Applied Arts
143 Fine Arts Building
Urbana, Illinois

Indiana University
Fine Arts Building
Bloomington, Indiana

Indiana State University
Terre Haute, Indiana

Wichita Art Association
9112 East Central
Wichita, Kansas

Louisville Art Center School
2111 South First Street
Louisville, Kentucky

Newcomb College Art Department of
Tulane University
New Orleans, Louisiana

Haystack Mountain School of Crafts
Deer Isle, Maine

Boston Museum School
230 Fenway
Boston, Massachusetts

Plymouth Pottery
42 Summer Street
Plymouth, Massachusetts

Cranbrook Academy of Art
55 Lone Pine Road
Bloomfield Hills, Michigan

Rochester Art Center
320 East Center
Rochester, Minnesota

University of Missouri
Department of Art
Columbia, Missouri

University of Montana
Art Department
Missoula, Montana

University of New Hampshire
Department of the Arts
Durham, New Hampshire

Newark Museum of Art
43-49 Washington Street
Newark, New Jersey

State University of New York
College of Ceramics
Alfred University
Alfred, New York

Brooklyn Museum Art School
Eastern Parkway
Brooklyn, New York

Craft Students League
840 Eighth Avenue
New York, N.Y.

Greenwich House Pottery
16 Jones Street
New York, N.Y.

The New School for Social Research
66 West Twelfth Street
New York, N.Y.

Clay Art Center
40 Beech Street
Port Chester, L.I., New York

School for American Craftsmen
Rochester Institute of Technology
65 Plymouth Avenue, South
Rochester, New York

Syracuse University
School of Art
309 University Place
Syracuse, New York

Penland Institute of Art
11141 East Boulevard
Cleveland, Ohio

Ohio University
Athens, Ohio

Millersville State College
Millersville, Pennsylvania

Rhode Island School of Design
Providence, Rhode Island

Museum School of Art of Houston
1001 Bissonnett
Houston, Texas

Stout State University
Menomonie, Wisconsin

Wisconsin State University
River Falls, Wisconsin

SUGGESTED REFERENCES FOR TEACHERS

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MAT CONE 04

White lead	27.5
Dolomite	3.9
Barium carbonate	12.6
Oxford spar	7.4
China clay	11.5
Flint	36.9

MEDIUM FIRE-MAT CONE 04

Feldspar	40
Whiting	6
Barium carbonate	7.5
Zinc oxide	6.1
Talc	2
Kaolin	5
Ball clay	3.8
Flint	18.2

GLAZE CONE 04

Whiting	15.3
White lead	23
Feldspar	30
Kaolin	7
Flint	7.1

ZINC CRISTAL CONE 04

Soda ash	13.1
Boric acid	15.2
Zinc oxide	12.7
Flint	41.8
Rutile	6.6
Ball clay	6

AVENTURINE CONE 04

Ferro frit 3304	99
Red iron oxide	16
Florida kaolin	5

LEAD COLEMANITE CONE 04

Flint	7.2
Oxford spar	52.9
White lead	19.4
Dolomite	5.5
Colemanite	12.4
Zinc oxide	2.4

COLEMANITE CONE 04

Oxford spar	46.8
Flint	20
China clay	2.5
Whiting	8.3
Colemanite	13.7
Zinc oxide	4
Dolomite	6

MILKY COLEMANITE CONE 04

Oxford spar	43.9
Flint	24.7
Clay	1
Colemanite	20.6
Whiting	1.5
Zinc Oxide	3.2
Barium carbonate ..	6.4

TRANSPARENT COLEMANITE CONE 04

Oxford spar	47
Colemanite	17.4
Barium carbonate ..	7.2

TRANSPARENT GREEN CONE 04

White lead	129
Whiting	30
Feldspar	111.2
Kaolin	12.9
Flint	48
Copper Oxide	9.48

TRANSPARENT BLUE CONE 04

White lead	116.1
Whiting	30
Feldspar	111.2
Kaolin	12.9
Flint	48
Cobalt oxide	4

CLEAR LEAD CONE 04

White lead	45.9
Oxford spar	31.3
China clay	3
Talc	1.8
Flint	11.8
Whiting	6

BARIUM MAT CONE 04

White lead	43.2
Barium carbonate ...	11
Oxford spar	39.2
China clay	2.1
Flint	4.4

GREEN ANTIQUE CONE 03-04

White lead	227.8
Feldspar	41.3
Flint	48.24
Kaolin	6.45
Copper oxide	7

BLUE ANTIQUE CONE 03-04

White lead	237.37
Feldspar	3.5
Flint	4.3
Cobalt oxide	1.9

CREAM ANTIQUE CONE 03-04

White lead	232.2
Feldspar	49.8
Flint	49.5
Barium oxide	7
Pink base	16

HIGH LIME, SEMI OPAQUE CONE 04

White lead	38.8
Oxford spar	42.3
Flint	5.4
China clay	4.6
Whiting	7.5
Magnesium carbonate	1.3

TRANSPARENT LEAD CONE 04

White lead	52.1
Oxford spar	20.3
Flint	18.7
China clay	3.0
Whiting	5.8

WHITE OPAQUE CONE 05-04

White lead	129
Whiting	30
Canadian feldspar ..	111.4
Kaolin	12.9
Flint	48
Tin oxide	45

ORANGE OPAQUE CONE 05-04

White lead	129
Whiting	30
Canadian feldspar .	111.4
Kaolin	12.9
Flint	48
Tin oxide	45
Iron oxide	19.2

BROWN OPAQUE CONE 05-04

White lead	141.9
Whiting	30
Eureka spar	112.8
Kaolin	10.3
Flint	43.4
Tin oxide	30
Chestnut brown base	30

GREEN RUTILE MAT CONE 04

White lead	227.8
Feldspar	41.3
Kaolin	6.45
Flint	48.24
Rutile	22.8
Copper oxide	7

YELLOW TRANSPARENT CONE 04-05

White lead	129
Whiting	30
Canadian feldspar .	111.2
Kaolin	12.9
Flint	48
Yellow base	33

BLUE TRANSPARENT CONE 04-05

White lead 116.1
Whiting 30
Canadian feldspar ... 111.2
Kaolin 12.9
Flint 48

TRANSPARENT PURPLE CONE 04

White lead 103.2
Whiting 30
Canadian feldspar ... 111.2
Kaolin 12.9
Flint 48
Manganese carbonate . 8.4

TRANSPARENT OCRE CONE 04

White lead 129
Whiting 30
Canadian feldspar ... 111.2
Kaolin 12.9
Flint 48
Iron oxide 19.2

TRANSPARENT WHITE CONE 04

White lead 129
Whiting 30
Canadian feldspar ... 111.2
Kaolin 12.2
Flint 48

AVENTURINE CONE 04

Ferro-enamel frit 3304 80
Ball clay 5
Red iron oxide 15

IRON RED CONE 04

Ferro-enamel frit 3304 87
Ball clay 5
Red iron oxide 8

BROWN LUSTRE CONE 04

White lead	58
Feldspar	13
China clay	4
Flint	16
Manganese carbonate ...	6
Iron oxide	3

COLEMANITE BARIUM MAT CONE 04

Oxford spar	46.8
Flint	10
Colemanite	11
Whiting	13
Barium carbonate	13
Zinc oxide	4

RETICULATION CONE 04

Ferro-enamel frit 3304	68
Colemanite	12
Ball clay	8
Zircopax	12

LUSTRE CONE 04

Ferro-enamel frit 3195	87
Ball clay	10
Silver nitrate	1
Bismuth Subnitrate ...	2

BASIC GLAZE CONE 05

White lead	100
Whiting	15
Feldspar	35
Kaolin	8
Flint	25

RAW ALKALINE CONE 05

Borax	32
Soda Ash	16
Whiting	7
Feldspar	20
China clay	5
Flint	20

CLEAR GLAZE CONE 05

Frit #k-3	20
Ultrox	4
Silica	2.5
Plastic vitrox	2
China clay	2

ALKALINE CONE 05

Soda ash	64
Whiting	30
Feldspar	56
Silica	42

VOLCANIC ASH CONE 05

Volcanic ash	67
Colemanite	28
Bentonite	5

STONEWARE CONE 05

Feldspar	35
Dolomite	16
Whiting	6
China clay	9
Flint	34

LOW FIRE TRANSPARENT CONE 05

White lead	78
Whiting	13
China clay	9

JEWEL GLAZE CONE 05

Pemco frit P-64	60
Borax	30
China clay	2
Zinc oxide	8

TRANSPARENT BLUE GLAZE CONE 05

White lead	116.1
Whiting	30
Canadian feldspar	111.2
Kaolin	12.9
Flint	48

GUN METAL BLACK CONE 05

Soda ash	17
White lead	27
Zinc oxide	2
Feldspar	22
Flint	17
Tin oxide	5
Copper carbonate	10

AVENTURINE CONE 05

Borax	172.9
Barium carbonate	9.8
Boric acid	12.4
Kaolin	6.4
Flint	177.8
Red iron oxide	67

BOROSILICATE GLAZE CONE 05

Colemanite	30
Feldspar	45
Zinc oxide	5
Barium carbonate	6
China clay	4
Flint	10

LITHIUM BLUE CONE 05

Lithium carbonate.....	26.9
Kaolin	13.6
Flint	53.9
Bentonite	2.8
Copper carbonate	3.7

OPAQUE WHITE GLAZE CONE 05

White lead ,.....	129
Whiting	30
Canadian feldspar	111.4
Kaolin	12.9
Flint	48
Tin oxide	45

MAT OPAQUE CONE 05

Lead carbonate	610
Feldspar	110
EPK China clay	30
Silica	190
Rutile	60

BARIUM MAT CONE 05

White lead	38
Whiting	5
Feldspar	19
Barium carbonate	13
Calcined zinc oxide	3
Flint	15
China clay	7

PURPLE GLAZE CONE 05

Soda Ash	50
Magnesium carbonate	25
Boric acid	200
Flint	50
Cobalt oxide	5

YELLOW MAT CONE 05

White lead	155
Whiting	30
Eureka spar	83
Kaolin	33
Georgia clay	13
Yellow base	28

GREEN MAT CONE 05

White lead	124
Whiting	30
Eureka spar	83
Kaolin	33
Georgia clay	13
Copper oxide	9.5

BLUE MAT CONE 05

White lead	121.6
Whiting	20
Calcined kaolin	13.9
Barium carbonate	39.4
China clay	55.7
Flint	31.02

WHITE MAJOLICA MAT CONE 05

Frit #3304	70
Ball clay	7
Tin oxide	23

WHITE MAT CONE 05

White lead	155
Whiting	30
Eureka spar	83
Calcined kaolin	33
Georgia clay	13

BROWN MAT CONE 05

White lead	129
Whiting	30
Eureka spar	83
Calcined kaolin	33
Georgia clay	13
Manganese carbonate	11.5

PINK MAT CONE 05

White	155
Whiting	30
Eureka spar	83
Calcined kaolin	33
Georgia clay	13
Pink base	20

OCHRE MAT CONE 05

White lead	129
Whiting	30
Eureka spar	83
Calcined kaolin	33
Georgia clay	13
Iron oxide	8

BUTTERSCOTCH OPAQUE CONE 06

Barnard slip	45
Wood ash	45
Lithium carbonate	10
Bentonite	2

MATT PATENNED GLAZE CONE 06

Lepidolite	50.3
Whiting	19.9
Flint	29.8
Bentonite	2

FOAM OR LAVA GLAZE CONE 06

O. Hommel Frit	14
Tin oxide	1.5
Bentonite	1
Barium sulfate	30

JEWEL GLAZE CONE 06

Pemeo frit	60
Borax	30
China clay	2
Zinc oxide	8

BASIC CLEAR TRANSPARENT CONE 06

White lead	100
Whiting	15
Feldspar	35
Kaolin	8
Flint	25

CELADONE REDUCTION CONE 06

Potash feldspar	61.3
Whiting	7.3
Kaolin	4.9
Flint	24.8
Red iron oxide	1.5

CHOCOLATE CONE 06

Albany slip	85
Lithium carbonate	11
Tin oxide	4
Bontonite	2

COPPER RED REDUCTION CONE 06

White lead	40
Red lead	40
Whiting	20
Kaolin	10
Flint	100
Borax	100
Boric acid	15
Soda ash	15
Tin oxide	5
Copper oxide	2

CRATERED GLAZE CONE 06

Talc	45.5
Lopidolite	54.4
Bentonito	2

FRITTED WHITE CRACKLE CONE 06

Ferro frit enamel	3304,85
Tin oxide	15

TRANSPARENT MATT CONE 06

Feldspar	516
Flint	56
Whiting	86
Kaolin	154

ALKALINE RUTILE CONE 06

White lead	27
Whiting	4
Borxer	18
Feldspar	18
Flint	18
Rutile	5
Tin oxide	10

MATT GLAZE RAW OR BISQUE WARE CONE 06

Lead carbonate	165
Feldspar	107.5
Kaolin	72.5
Wollastonite	41.7
Zinc oxide	12.5
Silica	7.5
Tin oxide	7.2
Rutile	3.5
Bentonite	3.2

MATT GLAZE CONE 06

Zinc oxide	18.8
Whiting	3.9
Lithium carbonate ...	8.6
China clay	21.1
Flint	41.5
Titanium oxide	6.1

ALUMINA MATT CONE 06

White lead	40
Whiting	11
Feldspar	20
China clay	16
Flint	7

PORCELAIN GLAZE CONE 06

Feldspar	27
Whiting	20
China clay	20
Flint	33

ALUMINA COLEMANITE CONE 06

White lead	34
Whiting	15
Colemanite	10
Feldspar	9
China clay	14
Flint	17
Zereopax	11

SEMIMAT GLAZE CONE 06

Whiting	9.8
Talc	2.1
Barium carbonate	11
Calcined zinc oxide .	4.3
Soda feldspar	42.5
Kaolin	8.3
Ball clay	8
Flint	14

RAW LEAD VOLCANIC ASH CONE 05

White lead	35
Zinc oxide	1
Volcanic ash	52
Whiting	8
China clay	4

BARIUM ZINC MAT CONE 05

White lead	38
Whiting	5
Feldspar	19
Barium carbonate	13
Zinc oxide	3
China clay	7
Flint	15

RAW BORAX VOLCANIC ASH CONE 06-05

Volcanic ash	67
Raw borax	28
Bentonite	5

WHITE MAJOLICA MAT CONE 05

Fritt #3304	70
Ball clay	7
Tin oxide	23

VOLCANIC ASH CONE 05

Volcanic ash	67
Colemanite	28
Bentonite	5

CHROMIUM RED GLAZE CONE 05

Red lead	67
Potassium bichromate	5
Soda ash	2
China clay	8
Flint	18

STONEWARE GLAZE CONE 05

Feldspar	35
Colomite	16
Whiting	6
China clay	39
Flint	34

COLEMANITE GLAZE CONE 05

Colemanite	30
Feldspar	45
Zinc oxide	5
Barium carbonate	6
China clay	4
Flint	10

ALKALINE GLOSS GLAZE CONE 05

Soda ash	28
Whiting	10
Feldspar	50
Flint	12

BRISTOL GLAZE USING DOLOMITE CONE 05

Zinc oxide	6
Dolomite	10
Feldspar	67
China clay	8
Flint	9

MAT (RAW OR BISQUE WARE) CONE 05

Feldspar	52...52
Silica	6... 8
Whiting	20...20
Zinc	9... 9
Kaolin	10...16
Bentonite	5...5
Zircopax	0...3

Oxidation.Reduction